A Paradigm Shift in Teaching OOT

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Objects in Action

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- **Abstract**. Since the time OOT is around, people need to be educated in OO. And also since then, educators are debatting how they can make teaching OO easier. The idea which is presented here, introduces the paradigm shift in teaching. This paradigm shift consists out of several parts, some of them are already known, but they have so far never been related to each other. These parts are: Pedagogical Patterns; Reflection in Learning and Empowering in Communication. I will go in depth in each of these components and I will point out in which way they are fulfilling their task for making the paradigm shift.

Introduction

- Discussions at conferences like the Educators' Symposium are showing clear that we still feel it's difficult to teach OO. And it doesn't matter where the education takes place - it's hard to teach OO in industry and in academia. But why is it hard? Most of us share the idea that teaching OT is hard, because the students have to make a paradigm shift. And that's absolutely true, especially when the students are proeducated in structural thinking and programming. Knowing that, does this mean we have to live this hard life? Or are there tips and tricks around for making our life easier? The answer is yes, there are already remedies around.

The remedy is based on the idea, that if all the people dealing with OT in analysis, design and programming have to make a paradigm shift for learning OO, then it should also be necessary for the educators to make the paradigm shift in *teaching* OO. The way we taught structural thinking doesn't work for teaching OO. Perhaps that's the reason why teaching OO is hard. This means we have to change the way we teach. In summary, picking up OT is difficult for the students, because we educators still haven't made the paradigm shift.

The Paradigm Shift

- There are already some discussions going on to simplify teaching OT. I will show how the results of these discussions fit in the idea of the paradigm shift.

I would like to point out three important things that are going on, but they are still discussed independently. The first component I want to look at, are the pedagogical patterns, the second evolution is the reflective learning and the last one is what's going on underneath the communication between educators and students.

Pedagogical Patterns

A year ago another *gang of four* initiated at different conferences workshops on pedagogical patterns [8]. The idea for the workshops was based on Susan Lilly's article [7]. The intention was to share some common concepts in teaching OT with other educators, so the educators can profit from another. The objectives for the workshop were:

- make learning easier for the students

- make teaching OO easier for us

- ... and find a generic way for achieving these goals

The overall goal is to provide a handbook where all the approved patterns are explained in an understandable way. This handbook will be similar to the Design Patterns [6], but specially developed for educators in which they can find some patterns or a whole pattern language for their own usage.

What is still missing here is a pattern language, for showing a way how these patterns could be connected. And besides, the structure of the patterns should be improved. Right now the pedagogical patterns are too close to the design patterns. For really being general and focusing on the educational and not on the technical task we should go back and take a closer look at the work Christopher Alexander [1] as well as at the work educators in different branches have done. Antons introduces e.g. in [3] tips and tricks for training and coaching, where the examples are presented in the following structure:

- headword - to recognize the applicability

- title

- goals - what the students should achieve

- indication - applicability

- type and participants - define the environment, e.g. split the students up in small groups

- performance - implementation

- duration

- material - only if something additional to slides and board is necessary

- suitable papers - which help to implement the pattern

- author

- literature, experiences - also example instances

- evaluation guidelines - to control if the goals were achieved

- variations

- analogous - different patterns to reach the same goal

The structure presented above is used to collect best practices in the work with groups and is around for a long time.

What we need to make our pedagogical patterns really applicable, is a mixin between the technical or design patterns and these patterns that are discovered and used in education for a while, because this mixin is exactly our task.

Additionally we should take care on three points, which are related to [4], when developing pedagogical patterns, the patterns should be:

- extensible - they should give the educator the freedom to go in depth in different parts without breaking the pattern

- flexible - is the possibility to react on the students feedback

- fixable - means clarifying an upcoming problem shouldn't lead to the next problem

Reflection in Learning

The way most of us teach right now is in a rather formal and structured manner. As it is already reflected in the word *structured* it becomes obvious that this has really nothing to do with OO. Mostly the courses are hold today in this way: The educator explains the concepts and thereafter the students get the possibility to approve what they have learned in a lab session.

The idea here is that the way of teaching could also be done in an OO way. This means we have no more 'main programm' - the educator - but a lot of small and self responsible objects, which interact with each other. Each of which is responsible for itself, has a well defined interface and so on. Translated does this mean the students are all these little objects which have their own responsibility in learning. They get triggered by events and messages from the outside or rather from other objects, which could be again students or the educator.

This way of teaching is best known by Bruce Anderson [2], who defined the term of *Task and Reflection in Learning*. The students learn by reflection, they get the problems or the task presented by the educator and figure the solutions out by themselves by using their experience. Whereas almost always we teach today the other way round. - We give the students the solutions and they have to pick them up, but they don't develop the solutions on their own.

Figure 1: excitement ⟶ uncertainty
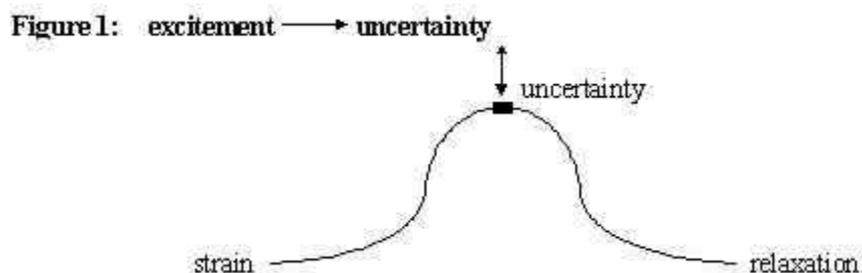
This goes hand in hand with what is known as irritation or uncertainty [9], which is a common concept in training: A problem is presented to the students which they have to solve, but the educator doesn't show them a structured way how they can move forward. Often the students are irritated or uncertain in how to come any further. Some people aren't able to handle a situation like this at all. If this is the case, then the trainer has to provide hints, so the students are able to overcome their own uncertainty and handle the situation for themselves. The difficulty for the educator is to find the optimum way between giving a structure (so the students don't explore for themselves anymore) and *laissez-faire*, which could be interpreted as not being a capable trainer, which is most often shown in really bored faces. Sollmann found out in [9] the more often the students are in this uncertain situation the better they can handle this kind of situation, or rather the longer it takes till they really feel uncertain. This effect is shown in figure 1. It's like in a physical training situation, the more often you're overcoming your limits, the higher your limits will raise.

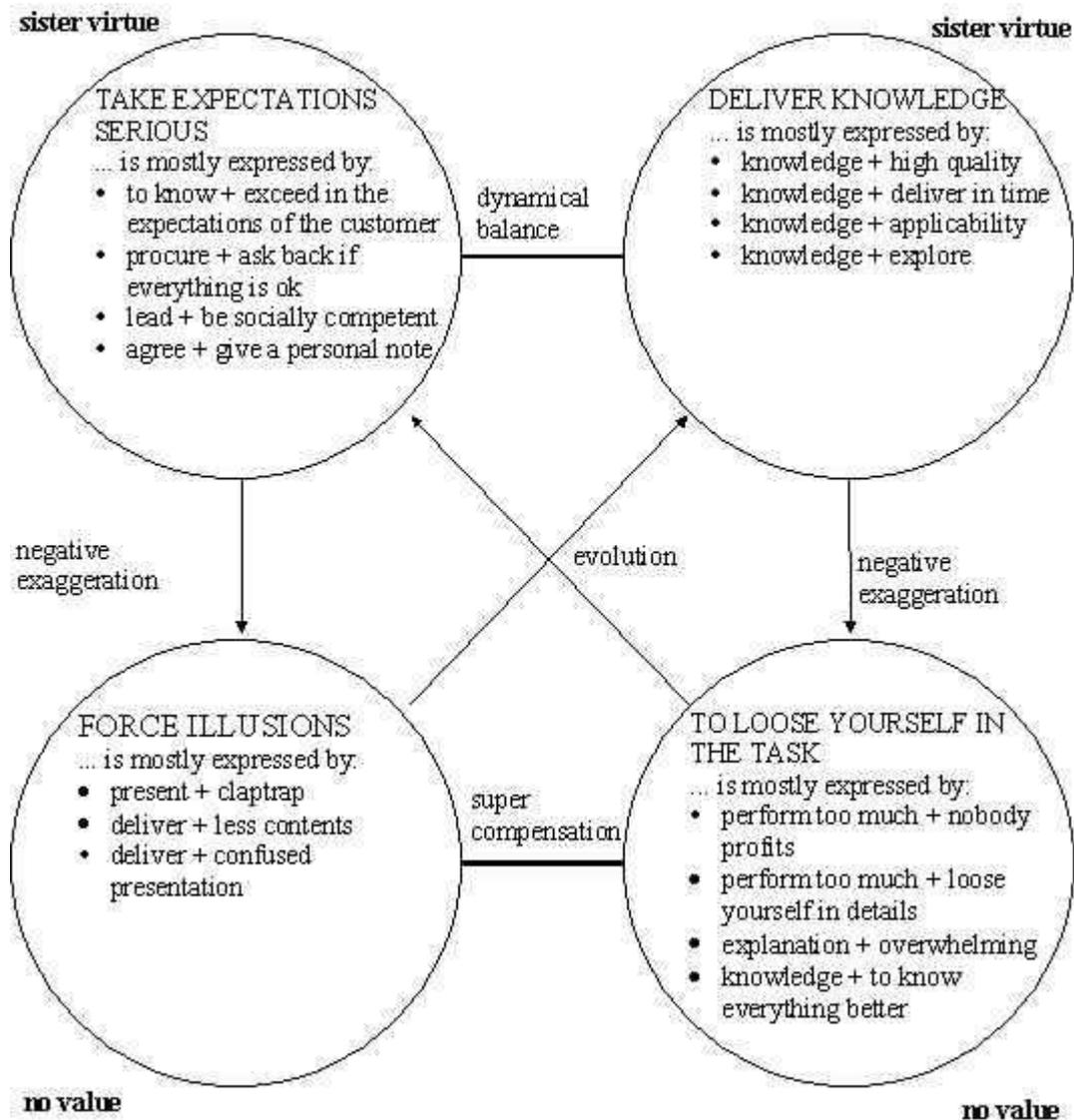## Empowering in Communication

Here I want to point out the big three in teaching which is related to [4]:

- Teach the right thing

- Teach the thing right

- Support the next thing

How to *teach the right thing* is best expressed by the *value square*, which is presented in figure 2, introduced by [5]. How to read the value square: *Meeting the expectations is our success* is fulfilled best if we take on the one hand the expectations of the customer for serious, that means we recognize and handle the fears and expectations of the customer. On the other hand it's fulfilled best if we deliver real knowledge, which is expressed by delivering the know-how in a high quality and every topic at the right time. So speaken *Meeting the expectations is our success* does not only mean to deliver knowledge but it also means to take the expectations of the customer serious for receiving an equalized and positive counterbalance to the value of the knowledge delivery. Both values define this way a dynamic balance and they should always both be considered, depending on the situation. In one situation the expectations of the customer are more important while in another situation the delivery of knowledge. Beneath those two exist the so called *no values* which are tagged *Force Illusions* and *Loose yourself in the Task*.

These *no values* are originated by exaggerating either the value *Take Expectations Serious* or the value *Deliver Knowledge*. This means if we exaggerate and take the expectations too serious we will force illusions. And if we exaggerate the delivery of knowledge we will loose ourselves in the task.

Figure 2: Meeting the expectations is our success

sister virtue

TAKE EXPECTATIONS SERIOUS
... is mostly expressed by:
- to know + exceed in the expectations of the customer
- procure + ask back if everything is ok
- lead + be socially competent
- agree + give a personal note

dynamical balance

sister virtue

DELIVER KNOWLEDGE
... is mostly expressed by:
- knowledge + high quality
- knowledge + deliver in time
- knowledge + applicability
- knowledge + explore

negative exaggeration

evolution

negative exaggeration

FORCE ILLUSIONS
... is mostly expressed by:
- present + claptrap
- deliver + less contents
- deliver + confused presentation

super compensation

TO LOOSE YOURSELF IN THE TASK
... is mostly expressed by:
- perform too much + nobody profits
- perform too much + loose yourself in details
- explanation + overwhelming
- knowledge + to know everything better

no value

no value

The most important thing when using the method of the *value square* is the possibility to define the evolution path if we are in the *no value* area. If you loose yourself in the task you surely don't have to evolute the delivery of knowledge, but you have to take the expectations more serious for achieving a balance. And on the other side if the illusions are too high you have to evolute the delivery of knowledge. In the presentation of *value squares,* evolution goes always diagonal.

The second one - *teach the thing right* - is mainly based on communication. Sure it also means use the patterns and reflective learning that we have seen above. But it focuses on the communication with the students, if the communication does not work, the best pattern could not help either, because: Communication is everything in teaching! We should always keep in mind the point Watzlawick first introduced in [10]; communication takes always place between a sender and a receiver, this is shown in figure 3.

Figure 3: Communication

sender   receiver
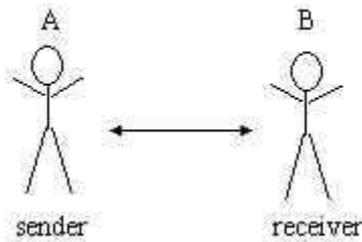
This stands for: It's not true what A tells, but what B understands. The educator should always take care that she talks about what the students are able and willing to understand. This is best recognized by listening attentively to the students. Listening means here also be attentive to non verbal signs.

The last point was: *Support the next thing*. This means all the topics should be related to another - the end of the first topic should be the beginning of the second topic etc. This way the students are able to grasp the whole picture about the course contents.

How it is all related

The reflective learning could be seen as the outer most pattern if we stay in the way Christopher Alexander explains how patterns are related [1]. Empowering in Communication is something that is reflected in all the areas so we have to consider it everytime and everywhere (this is also true in the private area). Embedded in the reflective learning pattern we have all these little patterns, which are collected in these pedagogical patterns workshops. So as a whole we'll get the picture, shown in figure 4.

Figure 4: How it is all related

Pedagogical Patterns

Empowering Communication

Reflective Learning
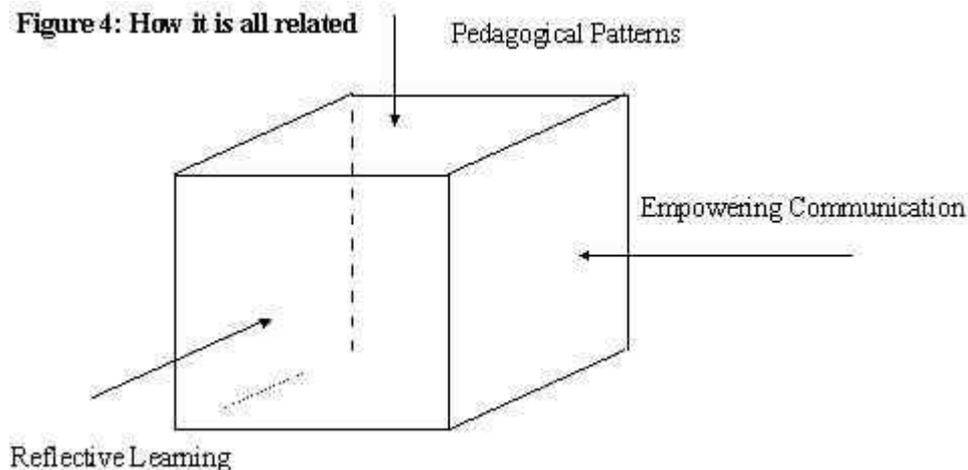
Conclusion

- I have shown some guidelines and tools for making the paradigm shift as an educator. This is by no means complete, but we're on the way in educate ourselves for becoming better teachers. Improving these guidelines (pedagogical patterns, reflective learning and empowering in communication) will lead us to a tool which could be used by beginners in teaching and which will make them successful just from the start.

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